The Game Of Recourse: Simulating Algorithmic Recourse over Time to Improve Its Reliability and Fairness

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Algorithmic Recourse Over Time

Algorithmic Recourse is concerned with answering two questions:

1. **Why** an outcome was produced by the system
2. **What** can be done in order to reverse it

Algorithms are being used to evaluate **whether an individual is approved for a loan**.

Algorithmic recourse would tell individuals **what actions they can take so that if they re-apply for a loan**

Algorithmic Recourse can be critically important:

1. Many have argued that providing recourse is **morally good and equitable**, particularly for marginalized groups
2. Recourse can **improve systems**
3. Recourse will likely soon be **codified into law**

Challenges

Datasets

- The entirety of well-cited work on recourse relies on popular open and archival datasets that were **not created with algorithmic recourse as their primary purpose**

- Even for the near-universally accepted example of "recourse when applying for a bank loan," **there is no publicly available data**
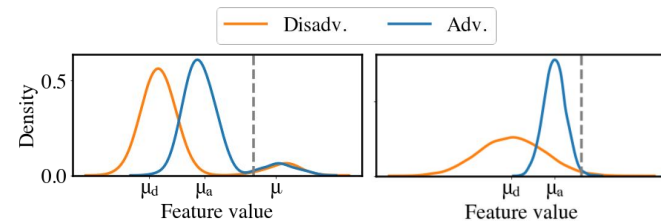
Can we use **agent-based modeling** to create synthetic data for studying recourse?

Reliability

Agent's score assigned by a decision-making algorithm

T time-steps
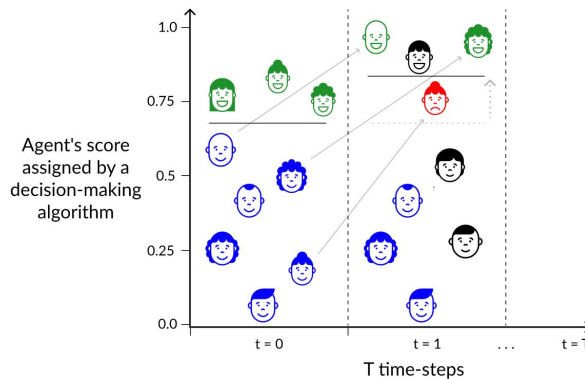
Time is intrinsic in Algorithmic Recourse!

Fairness

Disadvantaged individuals would have to put in significantly more effort to achieve recourse.

Classifier "fair" under demographic parity ≠ Fairness in recourse

The Game of Recourse

Datasets

Population ∧

Initial agents ⊙
20 − +

New agents per timestep ⊙
2 − +

Distribution type ⊙
Biased, some parity ∨

Qualification (bias factor) ⊙
2 − +

Several options to set up a population

Environment and Algorithmic Recourse algorithm can be configured in detail and simulation can be visualized

Metrics

Time To Recourse

Total Effort

Recourse Reliability

Group 0	Group 1
0.88	0.7

Fairness Metrics

Effort To Recourse Ratio	Time To Recourse Difference
1.39	-0.07

Robustness and fairness can be quantified and compared across groups, results can be exported

Summary

Software

- Our work introduces an agent-based simulation called The Game Of Recourse (an homage to Conway's Game of Life) to synthesize realistic algorithmic recourse data.
- We designed The Game Of Recourse with a focus on reliability and fairness, two areas of critical importance in socio-technical systems.

Source code